

Operations Research - Contemporary Role in Managerial Decision Making

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Abstract— As the global environment turns out to be furiously focused, Operations Research has picked up criticalness in applications like world-class Manufacturing systems (WCM), Lean generation, and Six-sigma quality administration, Benchmarking, Just-in-time (JIT) inventory techniques. The development of worldwide markets and the subsequent increment in rivalry have highlighted the requirement for Operation Research. To survive and lead the todays very focused and request driven market, weight is on administration to settle on conservative choices. One of the key administrative aptitudes is capacity to distribute and use assets fittingly in the endeavors of accomplishing the ideal execution productively. Now and again, for example, little scale low many-sided quality environment; choice in light of instinct with insignificant quantitative premise might be sensibly satisfactory and viable in accomplishing the objective of the association. Be that as it may, for a substantial scale framework, both quantitative and subjective (i.e. instinct, experience, sound judgment) investigations are required to settle on the most practical choices. Utilizing Operations Research techniques including Linear Programming, Discrete Event Simulation and Queuing Theory, association pioneers can settle on top notch choices. Present paper is an endeavor to study the importance of Operation research and different techniques used to improve the operational efficiency of the association.

Keywords— *Operations Research, Contemporary, Managerial, Decision Making, techniques, growth, increase, decision, performance, organization, Linear Programming, importance.*

I. INTRODUCTION

Operations Research (OR) is one of the prevalent administrative decision science instruments utilized by benefit and nonprofit organizations. As the worldwide environment turns out to be furiously focused, Operations Research has picked up essentialness in applications like world-class Manufacturing systems (WCM), Lean generation, Six-sigma quality administration, Benchmarking, Just-in-time (JIT) inventory techniques. The growth of global

markets and the subsequent increment in rivalry have highlighted the requirement for Operation Research [1-4]. Keeping in mind the end goal to be aggressive, organizations must meet the difficulties present in a global market by offering items and administrations that offer good value to their customers. Good value is a blend of ease, astounding, fast accessibility and constant data on these. Keeping in mind the end goal to upgrade the part of operational research and velocity up the process of different partners, they ought to work intently and supplement each other's exertion. In this process, the academicians ought to lead the pack in the outline, improvement and showing of supportable operational research models [5]. Industry ought to bolster this activity and quicken the transmission. This would guarantee riches creation in the short term, and practical improvement in the long haul. The administration ought to empower this activity by embracing improved reactions. Thusly, optimized policy responses and its usage would realize positive changes in the socio political and monetary environment. Accordingly, managed utilization of operational research would be a customary element in the decision making process of the administration, business and the general public [6]. Such a wide utilization of operational research models by the administration, business and academicians would add to the control as well as would add to the enhanced quality of life in India. The present paper is an attempt to highlight the significance of operation research, different techniques used and its application in business and industry.

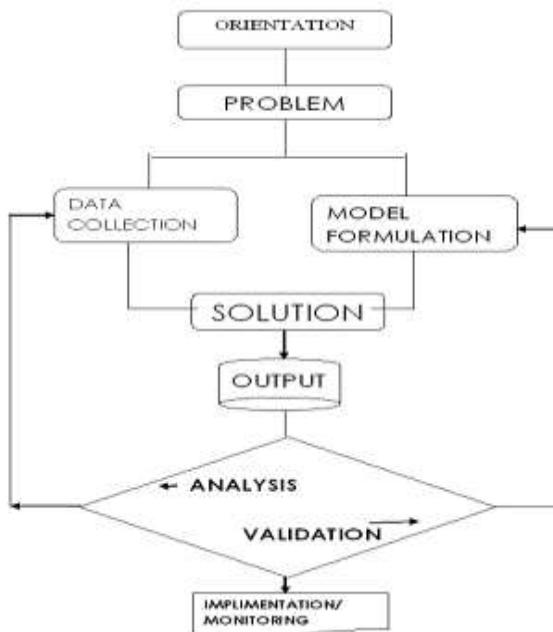
II. EVOLUTION OF OPERATION RESEARCH AS AN ACADEMIC DISCIPLINE

Because of this historical legacy, operational research was acknowledged as a legitimate management tool in protection research establishments and accordingly for productive resource planning and allocation by Government departments. Business supported the accelerated growth of this order by subsidizing genuine and potential applications. Over timeframe, a harmonious relationship between government, business and the scholarly world guaranteed the development and extension of the control for their shared

advantage. During the last 50 years, operational research has developed as a multidisciplinary capacity including financial aspects, arithmetic, insights, mechanical designing and administration. Extensively, operational research as an order can be classified into three distinct set of categories [7]. Blending models, optimized distribution system, portfolio optimization of assets would extensively speak to case under the category of models. Operational research strategy would include project management systems, multi criteria optimization, game theory, reproduction approach, information envelopment examination, undertaking asset arranging frameworks and strife resolution methods [8]. The instruments, models and technique of operational research have found an assortment of utilizations in various connections. Likewise, a few remarkable academicians have contributed to the development of this discipline.

III. OPERATIONS RESEARCH APPROACH

Given that O.R. represents an integrated framework to help make decisions, it is important to have a clear understanding of this framework so that it can be applied to a generic problem. To achieve this, the so-called O.R. approach is now detailed. This approach comprises the following seven sequential steps: (1) Orientation, (2) Problem Definition, (3) Data Collection, (4) Model Formulation, (5) Solution, (6) Model Validation and Output Analysis, and (7) Implementation and Monitoring. This is illustrated in the Flow Diagram:



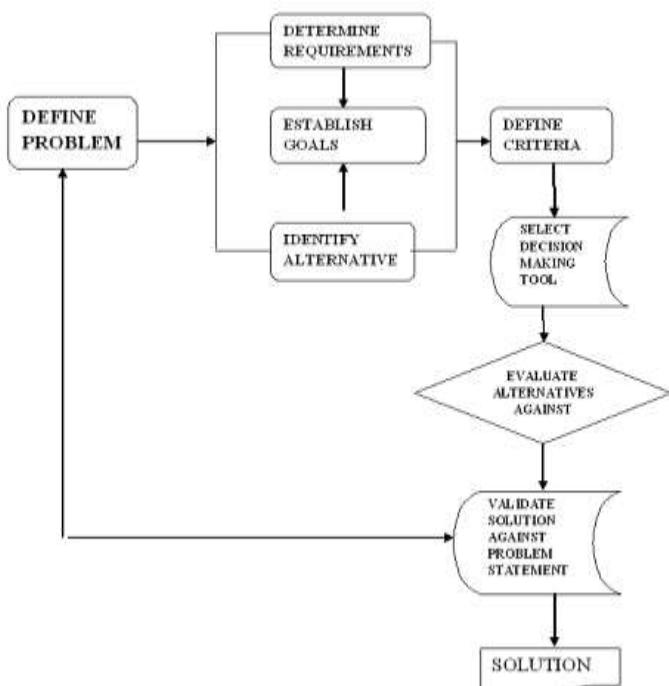
To illustrate how the means may be connected, consider a common situation where an assembling organization is arranging creation for the forthcoming month. The

organization makes utilization of various assets, (for example, work, creation hardware, crude materials, capital, information preparing, storage room, and material taking care of gear) to make various distinctive items which go after these assets. The items have contrasting overall revenues and require diverse measures of every asset. A number of the assets are restricted in their accessibility. Moreover, there are other entangling elements, for example, instability in the interest for the items, irregular machine breakdowns, and union understandings that confine how the labor force can be utilized. As a representation of how one may direct an operations research study to address this circumstance, consider a profoundly streamlined case of a generation arranging issue where there are two fundamental product offerings. Every item requires shifting measures of each of the resources and the organization acquires different costs (labor, raw materials etc.) in making the items and acknowledges distinctive incomes when they are sold. The goal of the O.R. undertaking is to apportion there sources to the two products in an optimal fashion.

IV. TECHNIQUES USED IN OPERATION RESEARCH

Decision Analysis: Decision analysis refers to a set of quantitative methods for analyzing decisions that use expected utility as the criterion for identifying the preferred alternative. Decision analysis provides tools for quantitatively analyzing decisions with uncertainty and/or multiple conflicting objectives, and these tools can be especially useful when there is limited directly relevant data so that expert judgment plays a significant role in the decision making process. It provides a systematic quantitative approach to making better decisions, rather than a description of how unaided decisions are made. A general decision making process can be divided into the following steps: 1. Define the problem 2. Determine the requirements 3. Establish Goals 4. Identify alternatives 5. Define criteria 6. Select a decision making tool 7. Evaluate alternatives against criteria 8. Validate solutions against problem statement

The above steps are illustrated through a Flow Diagram as given below:



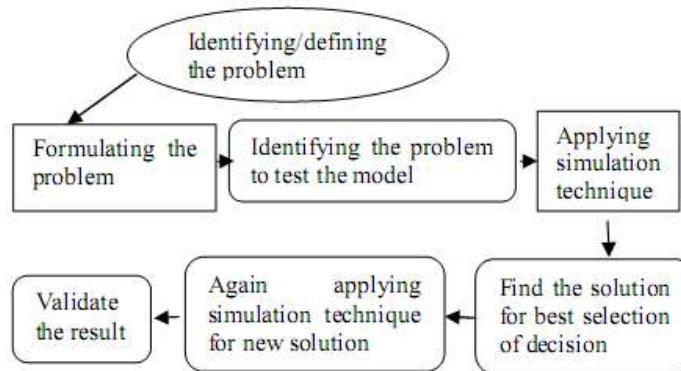
Linear programming: arose as a mathematical model developed during Second World War to plan expenditures and returns in order to reduce costs to the army and increase losses to the enemy. In Operation Research optimization means to find out the maximum profit and minimum loss[11] in any deal which we can done in Quantitative Techniques, in this we can narrowing our choices to the very best when there are virtually immeasurable feasible options. This is a constrained optimization technique, which optimize some criterion within some constraints. In Linear programming the objective function (profit, loss or return on investment) and constraints are linear.

Standard form of describing a linear programming problem consists of the following three parts:

- A linear function to be maximized
e.g. $\text{maximize } C_1x_1 + C_2x_2$
- Problem constraints of the following form
e.g. $a_{11}x_1 + a_{12}x_2 \leq b_1$
 $a_{21}x_1 + a_{22}x_2 \leq b_2$
 $a_{31}x_1 + a_{32}x_2 \leq b_3$
- Non-negative variables
e.g. $x_1 \geq 0$
 $x_2 \geq 0$

Simulation Technique: Simulation provides the alternative solution of the problem and provides choices to the decision maker to select the best solution for the problem. Thus by applying this technique, one can study the effects of environmental changes on the operation of a system by

making model of the system and finding the effect of these changes on the system's behavior. Simulation process for solving problem -



Simulation is a quantitative technique developed for studying alternative course of action by building a model of that system and then conducting a series of repeated trial and error experiments to predict the behavior of the system over a period of time [9].

Role of Computers in Solving Operation Research Problems:

The Operation Research problems are time consuming and involve tedious computations. Indeed, even a simple problem with couple of variables take quite a while to solve manually and even by a hand calculator. The appearance of computers accelerated the wide utilization of Operation Research techniques for solving complex business problems confronted by supervisors and executives in business and government [10]. The automation of computational calculation permits leaders to focus on problem's formulation and the elucidation of the solutions. Significant computer manufacturers and merchant have created software packages for the different computer systems giving computational backing to problems to be solved by the use of Operation Research techniques [9]. Some scholastic offices in various colleges have likewise created software packages for solving different Operation Research problems. Computer manufacturers like IBM, CDC, Honeywell, UNIVAC, ICL, and so forth have put significant sum in developing software programs for solving the optimizing, scheduling, inventory, simulation and different Operation Research problems. Likewise huge scale simulations are conceivable just through computers by utilizing GPSS software packages.

Growth of Operation Research in Different Sectors: The type of industries in which these techniques were applied includes Steel, Heavy Engineering, Chemical and Fertilizers, Textiles, Transportation & Distribution, and Electronics. The terminology "Operations Research" is somewhat misleading, since it is not only concerned with operations, but has

applications involving research in different areas and fields [11]. Operations Research is the discipline of applying advanced analytical methods to help make better decisions. By using techniques such as mathematical modeling to analyze complex situations, operations research gives executives the power to make more effective decisions and build more productive systems. The role of operational research in the Indian context is clear. It is not only important, it is even critical, given the size and magnitude of the tasks ahead to transform India as a developed nation. In order to achieve this goals, we need a responsive and accountable government to promote a positive environment of OR applications [12]. It is hoped that the Indian democracy would lead to this. It is believed that the globalization would further accelerate this transition.

Typical Applications of Operations:

- Research Capital budgeting.
- Asset allocation.
- Portfolio selection.
- Fraud prevention, Anti-Money Laundering.
- Benchmarking.
- Marketing channel optimization, Customer segmentation.
- Direct marketing campaigns, Predicting customer response, and Campaign optimization.
- Supply Chain Planning.
- Distribution, Routing, Scheduling, Traffic flow optimization.
- Resource allocation, Staff allocation.
- Inventory planning.
- Retail planning, Merchandise optimization.
- Product mix and blending, Industrial waste reduction.

Challenges in Operations Research: Due to vast quantities of information and calculation, solving optimization problems is challenging and time-consuming. In this way, such approach towards performance improvement could possibly be financially practical for some organizations. Various studies are led on improvement of more powerful and productive heuristic and definite calculations that can illuminate extensive scale optimization problems [11]. On the other hand is quantitative problem solving technique; thus, information plays important, if not the most important, part in delivering high caliber and executable solutions. With an organization that has information promptly accessible utilizing information system, for example, MRP and ERP ought to have the capacity to utilize the required data with certain level of honesty. Nonetheless, for a framework that is exceedingly manual, information driven decision science techniques presented here could conceivably be the appropriate approach. With organizations moving towards overseeing business with some type of vast information system; Linear Programming, Discrete Event Simulation and Queuing Theory will be most reasonable and proper decision tools. Respectability of information relies on upon numerous elements. Information system that requires manual contribution of information, flimsy network systems,

precarious projects and faulty equipment are a portion of the variables. The most important factor that decides high information respectability is human mistake while contributing information. Human mistakes can be minimized through instruction consolidated with hands-on preparing, for example, at work preparing. Tragically, numerous associations tend to concentrate vigorously on physical system implementation and give practically no consideration on instruction and preparing. In any case, workers are regularly denounced for not entering the information accurately and the nature of hardware and/or software is addressed for poor information respectability. Sustainment is as critical usage. An association can execute the world's most prominent database; however in the event that the staff in charge of operating and sustaining the system lacks knowledge of achieving and actualizing the world's greatest system is meaningless.

V. CONCLUSION

Operations Research is fundamentally a science of decision-making. Decision-making turns into a problem when the availability of alternatives is numerous. Operations Research techniques are of incredible backing to improve and suitable decisions since all the methods are logical and precise. To survive and lead the today's very aggressive and interest driven business sector, weight is on administration to make economical decisions. One of the crucial administrative aptitudes is capacity to distribute and use resources appropriately in the endeavors of accomplishing the optimal performance efficiently. In some cases, for example, little scale low complexity environment, decision based on instinct with minimal quantitative premise might be reasonably acceptable and practical in accomplishing the goal of the organization. In any case, for a substantial scale system, both quantitative and qualitative (i.e. intuition, experience, common sense) examinations are required to make the most economical decisions. Utilizing Operations Research techniques including Linear Programming, Discrete Event Simulation and Queuing Theory, association pioneers can make high quality decisions. Operations managers are not anticipated that would be specialists in any decision science tools; be that as it may, he or she should have key information of such tools to secure right assets and to make the most economically sounding decisions for the company as a whole.

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